526 Rec'd PCT/PTO 29 NOV 2000

FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
0112740-137	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	
09/701590	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE/99/01491	18 May 1999	29 May 1998

TITLE OF INVENTION

METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

APPLICANT(S) FOR DO/EO/US

Dr. Carsten Ball et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Submission of Drawings Fig. 1-5 on five sheets

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/701590	PCT/DE/99/01491	0112740-137

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1,000.00
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO	$860.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$710.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$690.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT = $860.00

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). $0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	15 - 20 =	0	x $18.00	$0.00
Independent claims	1 - 3 =	0	x $80.00	$0.00
Multiple Dependent Claims **(check if applicable)** .			☐	$0.00

TOTAL OF ABOVE CALCULATIONS = $860.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable)** . ☐ $0.00

SUBTOTAL = $860.00

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + $0.00

TOTAL NATIONAL FEE = $860.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐ $0.00

TOTAL FEES ENCLOSED = $860.00

Amount to be: refunded $

charged $

☒ A check in the amount of **$860.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690-1135

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

November 29, 2000
DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

APPLICANTS: Dr. Carsten Ball et al. DOCKET NO: 112740-137

SERIAL NO: GROUP ART UNIT:

EXAMINER:

INTERNATIONAL APPLICATION NO: PCT/DE99/01491

INTERNATIONAL FILING DATE: 18 May 1999

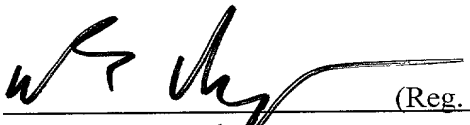
INVENTION: METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

Assistant Commissioner for Patents,
Washington, D.C. 20231

SUBMISSION OF DRAWINGS

Applicants herewith submit five sheets (Figs. 1-5) of drawings for the above-referenced PCT application.

Respectfully submitted,



(Reg. No. 39,056)

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Attorneys for Applicants

FIG 1A

Network planning result:

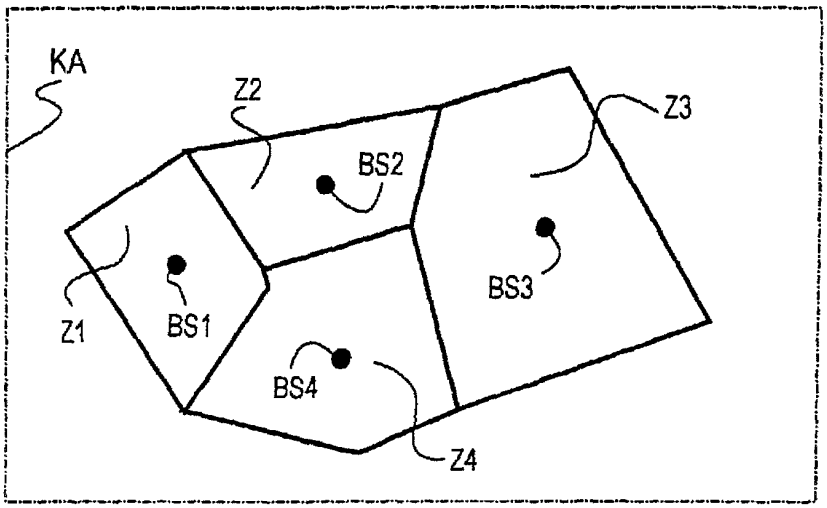


FIG 1B

Adjacency graph:

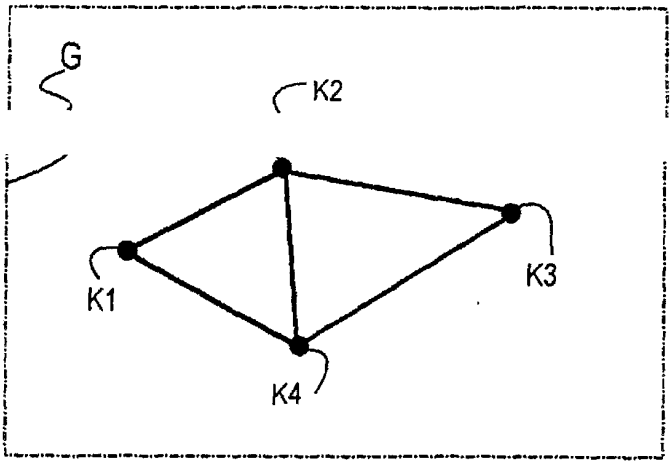
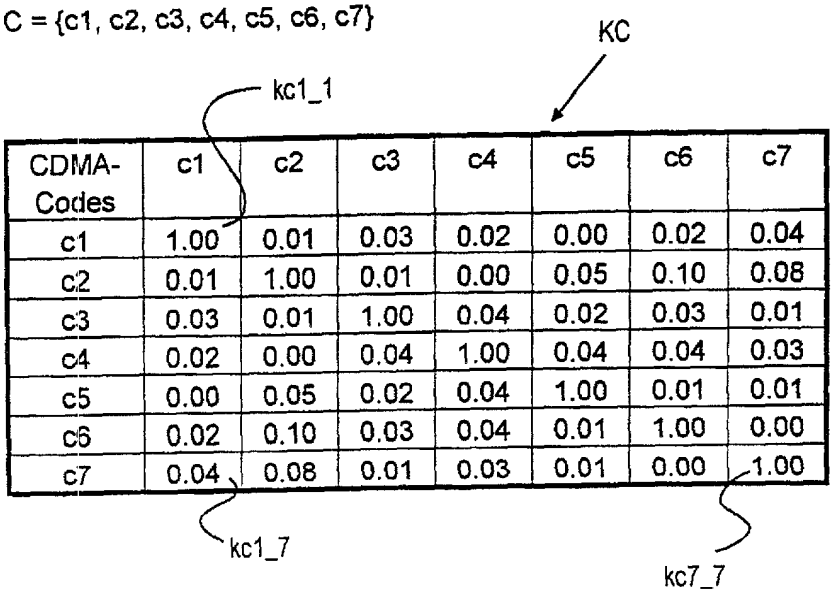


FIG 2A

C = {c1, c2, c3, c4, c5, c6, c7}



CDMA-Codes	c1	c2	c3	c4	c5	c6	c7
c1	1.00	0.01	0.03	0.02	0.00	0.02	0.04
c2	0.01	1.00	0.01	0.00	0.05	0.10	0.08
c3	0.03	0.01	1.00	0.04	0.02	0.03	0.01
c4	0.02	0.00	0.04	1.00	0.04	0.04	0.03
c5	0.00	0.05	0.02	0.04	1.00	0.01	0.01
c6	0.02	0.10	0.03	0.04	0.01	1.00	0.00
c7	0.04	0.08	0.01	0.03	0.01	0.00	1.00

FIG 2B

$$E = k1 * f1 + k2 * f2 + k3 * f3$$

where: k1 = 1000, k2 = 2000, k3 = 1000

f1: Number of CDMA codes used

f2: Number of identical CDMA codes in adjacent cells

f3: Total of the cross-correlations of the CDMA codes of adjacent cells

FIG 3A

Base station	CDMA code
BS1	c5
BS2	c6
BS3	c2
BS4	c2

FIG 3B

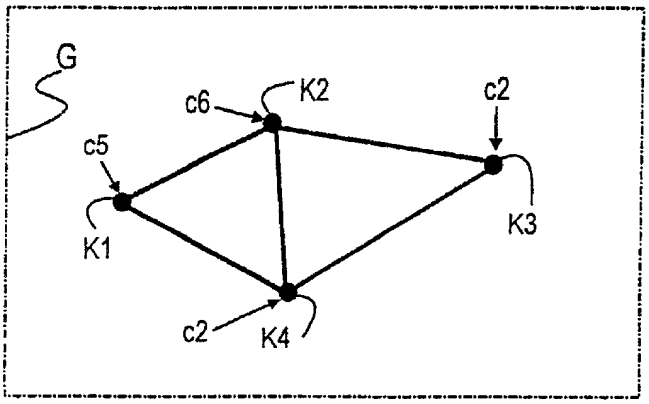


FIG 3C

E = 1000 * 3 (3 CDMA codes used: c2, c5, c6)
+ 2000 * 1 (1 CDMA code in adjacent cells)
+ 1000 * 1.26 (1.0 + 2 x 0.1 + 0.05 + 0.01)

where: c2↔c2 ⇒ kc2_2: 1.0
c6↔c2 ⇒ kc6_2: 0.1
c5↔c2 ⇒ kc5_2: 0.05
c5↔c6 ⇒ kc5_6: 0.01

= 6260

FIG 4

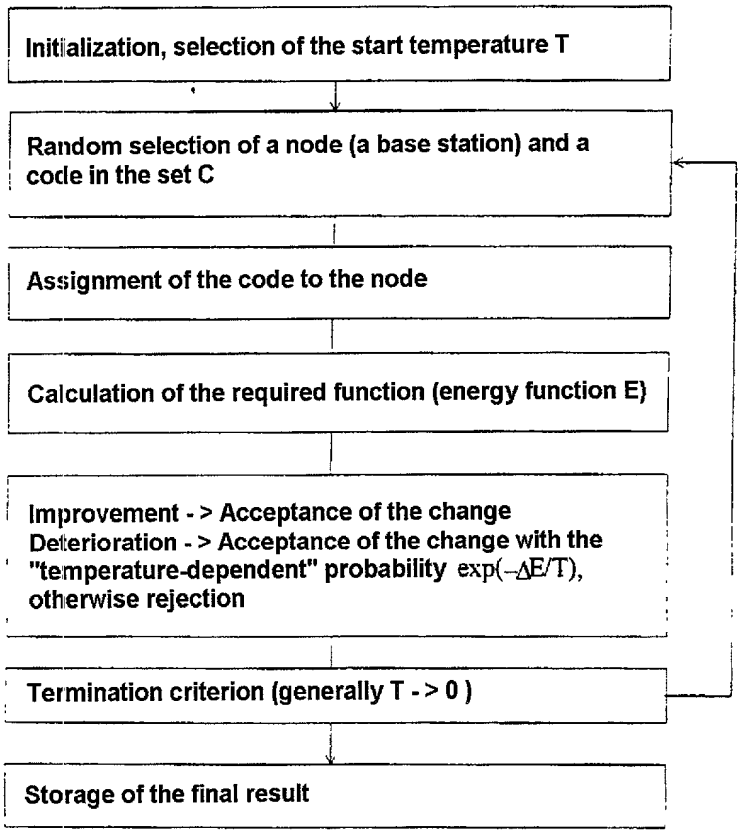


FIG 5A

Base station	CDMA code
BS1	c5
BS2	c1
BS3	c5
BS4	c6

FIG 5B

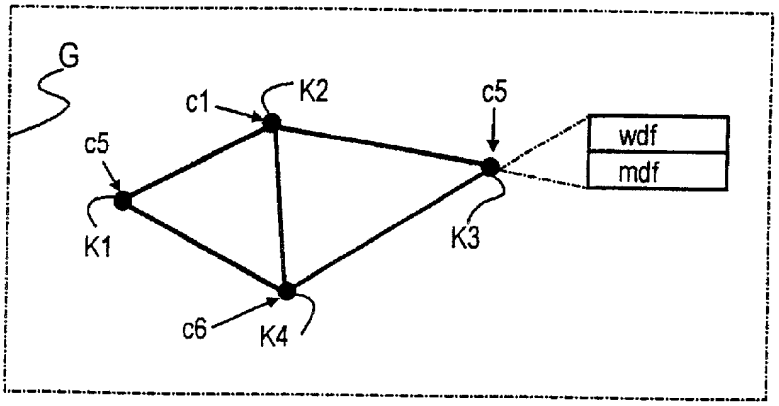


FIG 5C

E = 1000 * 3 (3 CDMA codes used: c2, c5, c6)
+ 2000 * 0 (no CDMA code in adjacent cells)
+ 1000 * 0.04 (2 x 0.0 + 2 x 0.01 + 0.02)

where: c2↔c5 ⇒ kc2_5: 0.0
c5↔c6 ⇒ kc5_6: 0.01
c1↔c6 ⇒ kc1_6: 0.02

= 3040

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS: Dr. Carsten Ball et al.	DOCKET NO: 112740-137
SERIAL NO:	GROUP ART UNIT:
	EXAMINER:
INTERNATIONAL APPLICATION NO:	PCT/DE99/01491
INTERNATIONAL FILING DATE:	18 May 1999
INVENTION:	METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In The Specification:

On page 1, cancel lines 1-5 and substitute the following therefor:

--S P E C I F I C A T I O N

TITLE

METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, generally, to a method for allocating at least one value of at least one transmission parameter to cells in a communication system having m cells and, more particularly, to such a method wherein a disturbance value is respectively determined for non-adjacent cells and an overall disturbance value representing a total of all such disturbance values is formed, and weighted, and a minimum overall disturbance value is ultimately reached.

Description of the Prior Art--.

On page 1, line 9, cancel the "-" and substitute therefor a --(--.

On page 1, line 10, cancel the "-" and substitute therefor --),--.

On page 1, line 12, cancel the "-" and substitute therefor a --(--.

On page 1, line 13,insert a --)-- after "RBS".

On page 1, line 23, cancel the "-" before "Radio" and substitute therefor a --(--.

On page 1, line 23, cancel the "-" after "Termination" and substitute therefor a --)--.

On page 1, line 26, cancel the "," and substitute therefor a --;--.

On page 1, line 26, insert a --,-- after "example".

On page 1, line 31, cancel the "," and substitute therefor a --;--.

On page 1, line 31, insert a --,-- after "particular".

On page 1, line 37, insert --the use of-- after "as".

On page 1a, line 1, cancel "modulation of" and substitute therefor --modulating--.

On page 2, line 4, cancel the "-" and substitute therefor a --,--.

On page 2, line 5, cancel the "-" and substitute therefor a --,--.

On page 2, line 8, insert –which-- after "and".

On page 2, line 8, cancel the "-" after "area" and substitute therefor a --,--.

On page 2, line 8, cancel the "-" after "Europe" and substitute therefor a --,--.

On page 2, line 11, cancel the "-" and substitute therefor a --;--.

On page 2, line 11, insert a --,-- after "example".

On page 2, line 12, cancel the "-" and substitute therefor --. This is done--.

On page 2, line 14, cancel the ",".

On page 2, line 15, cancel the "-" and substitute therefor a --;--.

On page 2, line 15, insert a --,-- after "example".

On page 2, line 24, cancel "arrangement" and substitute therefor --system--.

On page 2, line 26, insert –either-- after "with".

On page 2, line 26, cancel the "-" and substitute therefor a --)--.

On page 2, line 27, cancel the "-" after "Duplex"" and substitute therefor a --)--.

On page 2, line 27, cancel the "-" before ""Time" and substitute therefor a --(--.

On page 2, line 28, cancel the "-" and substitute therefor a --)--.

On page 2, line 30, cancel the "-" and substitute therefor a --(--.

On page 2, line 31, cancel the "-" after "Access" and substitute therefor a --)--.

On page 2, line 31, cancel the "-" before "Time" and substitute therefor a --(--.

On page 2, line 32, cancel the "-" before "and" and substitute therefor a --)--.

On page 2, line 32, cancel the "-" before "Code" and substitute therefor a --(--.

On page 2, line 32, cancel the "-" after "Access" and substitute therefor a --)--.

On page 2, line 36, cancel "arrangement" and substitute therefor --system--.

On page 2, line 37, cancel "said" and substitute therefor --such--.

On page 2, line 37, cancel the "-" and substitute therefor a --(--.

On page 2a, line 1, cancel the "-" and substitute therefor a --)--.

On page 3, line 2, cancel "arrangements" and substitute therefor --systems--.

On page 3, line 7, cancel "arrangement" and substitute therefor --system--.

On page 3, line 11, cancel ", that is to say" and substitute therefor --; i.e.,--.

On page 3, line 19, insert –which-- before "is".

On page 3, line 19, cancel "also".

On page 3, line 33, insert a --,-- after "is"-.

On page 3, line 34, insert a --,-- after "case".

On page 4, line 4, cancel ", in which" and substitute therefor --. In such--.

On page 4, line 4, insert a --,-- after "case".

On page 4, line 5, cancel "- that is to say" and substitute therefor --(i.e.,--.

On page 4, line 7, cancel "- ;" and substitute therefor --), wherein--.

On page 4, line 14, cancel "and" and substitute therefor --. Moreover, the CDMA basic codes--.

On page 4, line 21, cancel ", which" and substitute therefor --. The--.

On page 4, line 22, cancel "comprising" and substitute therefor --including--.

On page 4, line 30, insert a --,-- after "is".

On page 4, line 30, insert a --,-- after "case".

On page 5, before line 6, insert the following paragraphs:

--EP 0 565 499 A1 describes a method for allocating radio channels to base stations in a cellular mobile radio system. The allocation of the radio

channels is selected such that the interference between the individual radio channels is minimized for a specific traffic load. However, the technical teaching does not relate to a mobile radio system using a CDMA multiple access method.

A method for allocating radio channels in a communications system is known from US 5,455,821, in which the communications system is based on a TDMA and/or FDMA subscriber separation method. The application of the method to communications systems which use different codes to separate the subscribers is not disclosed, however.--

On page 5, line 6, insert –present-- before "invention".

On page 5, line 6, cancel "based on the object of" and substitute therefor --thus directed toward--.

On page 5, line 11, cancel "The object is achieved by the".

On page 5, cancel line 12.

On page 5, before line 13, insert the following centered heading:

--**SUMMARY OF THE INVENTION**--.

On page 5, line 13, cancel "The" and substitute therefor --A--.

On page 5, line 13, cancel "according to" and substitute therefor --of--.

On page 5, line 14, insert –present-- before "invention".

On page 5, line 23, insert a --,-- after 'is".

On page 5, line 24, insert a --,-- after "case".

On page 5, line 31, cancel "The" and substitute therefor --A--.

On page 5, line 31, cancel "according to" and substitute therefor --of--.

On page 5, line 32, insert –present-- before "invention".

On page 5, line 33, cancel "values of at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 5, line 34, cancel "arrangement" and substitute therefor --system--.

On page 6, line 5, cancel "arrangements" and substitute therefor --systems--.

On page 6, line 8, cancel "using simple means" and substitute therefor --relatively easily--.

On page 6, line 9, cancel "according to" and substitute therefor --of--.

On page 6, line 9, insert –present-- before "invention".

On page 6, lines 10-11, cancel "a transmission parameter" and substitute therefor --CDMA codes--.

On page 6, line 12, cancel "arrangement" and substitute therefor --system--.

On page 6, line 12, cancel "and this advantageously" and substitute therefor --which--.

On page 6, line 14, cancel "arrangement" and substitute therefor --system--.

On page 6, line 15, cancel "according to" and substitute therefor --of--.

On page 6, line 15, insert –present-- before "invention".

On page 6, lines 15-16, cancel "values of a number of transmission parameters" and substitute therefor --a number of CDMA codes--.

On page 6, line 17, cancel "arrangement" and substitute therefor --system--.

On page 6, line 19, cancel "according to" and substitute therefor --of--.

On page 6, line 19, insert –present-- before "invention".

On page 6, line 22, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 6, line 23, cancel "also".

On page 6, line 28, cancel "- claim 2".

On page 6, line 28, cancel "In this advantageous refinement" and substitute therefor --Accordingly--.

On page 6, lines 29-30, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 6, line 31, cancel "arrangement" and substitute therefor --system--.

On page 6, lines 34-35, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 6, line 36, cancel "arrangement" and substitute therefor --system--.

On page 6, line 36, cancel "thus".

On page 6a, line 2, cancel "arrangement" and substitute therefor --system--.

On page 6a, line 4, cancel "according to" and substitute therefor --of--.

On page 6a, line 4, insert –present-- before "invention".

On page 6a, line 6, cancel "arrangement" and substitute therefor --system--.

On page 7, lines 1-2, cancel "value of the at least one transmission parameter" and substitute therefor --further CDMA codes--.

On page 7, lines 3-4, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 7, lines 6-7, cancel "different values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 7, line 9, cancel "value" and substitute therefor --CDMA code--.

On page 7, line 11, cancel "- claim 3".

On page 7, line 12, cancel "advantageously".

On page 7, line 13, cancel "according to the invention".

On page 7, line 14, cancel "- that is to say" and substitute therefor --(i.e.,- -.

On page 7, lines 15-16, cancel "value of at least one transmission parameter" and substitute therefor --CDMA code--.

On page 7, line 17, cancel the "-" after "arrangement" and substitute therefor a --)--.

On page 7, lines 17-18, cancel "- that is to say" and substitute therefor --i.e.,--.

On page 7, line 20, insert a --)-- after "arrangement".

On page 7, lines 21-22, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 7, lines 33-34, cancel "- claim 4".

On page 7, line 35, insert –be-- after "can".

On page 7, line 36, cancel "be".

On page 7, lines 36-37, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 7a, line 1, cancel "arrangement" and substitute therefor --system--.

On page 7a, line 4, cancel "else".

On page 7a, line 4, cancel "- claim 12".

On page 8, line 2, cancel "by means of" and substitute therefor --via--.

On page 8, line 3, cancel "according to" and substitute therefor --of--.

On page 8, line 3, insert –present-- before "invention".

On page 8, line 16, cancel "one" and substitute therefor --another--.

On page 8, line 16, insert --of the present invention-- after "development".

On page 8, line 19, cancel "means of".

On page 8, lines 20-21, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 8, line 21, insert –have-- after "currently".

On page 8, line 25, cancel "means of".

On page 8, line 26, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 8, lines 33-34, cancel "different values of the at least one transmission parameter," and substitute therefor --CDMA codes--.

On page 8, line 36, cancel "- claim 5".

On page 8a, lines 2-3, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA code--.

On page 8a, line 4, cancel "arrangement" and substitute therefor --system--.

On page 8a, line 5, cancel the "," and substitute therefor --. This is so--.

On page 9, lines 5-6, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 9, line 9, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 9, lines 10-11, cancel "values of the at least one transmission parameter" and substitute therefor --CDMA codes--.

On page 9, line 12, cancel "arrangement, that" and substitute therefor --system. That--.

On page 9, line 12, cancel "to say" and substitute therefor a --,--.

On page 9, lines 13-14, cancel "values of the at least one transmission parameter," and substitute therefor --CDMA codes--.

On page 9, line 14, insert a --,-- after "and".

On page 9, line 14, insert a --,-- after "thus".

On page 9, line 16, cancel "arrangement" and substitute therefor --system--.

On page 9, lines 17-18, cancel "value of the at least one transmission parameter" and substitute therefor --CDMA code--.

On page 9, lines 24-25, cancel "value of the at least one transmission parameter" and substitute therefor --respective CDMA code--.

On page 9, line 25, cancel "in each case".

On page 9, lines 26-27, cancel "a transmission frequency or a transmission frequency band – claim 7 – or".

On page 9, lines 29-30, cancel "- claim 8".

On page 9, line 30, cancel "according to" and substitute therefor --of--.

On page 9, line 30, insert –present-- before "invention".

On page 9, line 30, cancel "can".

On page 9, line 31, insert –can-- after "advantageously".

On page 9, lines 33-34, cancel ", in which" and substitute therefor --. In such--.

On page 9a, line 1, cancel "arrangement" and substitute therefor -- system--.

On page 9a, line 2, cancel "according to" and substitute therefor --of--.

On page 9a, line 2, insert –present-- before "invention".

On page 10, line 7, insert a --,-- after "is".

On page 10, line 7, insert a --,-- after "case".

On page 10, line 11, cancel "with".

On page 10, lines 12-13, cancel "- claim 9".

On page 10, line 16, cancel the "," and substitute therefor a --;--.

On page 10, line 16, insert a --,-- after "thus".

On page 10, lines 17-18, cancel "according to" and substitute therefor -- of--.

On page 10, line 18, insert –present-- before "invention".

On page 10, line 19, cancel "one advantageous refinement" and substitute therefor -- a further embodiment of the present invention--.

On page 10, line 23, cancel "- claim 13".

On page 10, line 25, cancel "arrangement" and substitute therefor -- system--.

On page 10, line 30, cancel "- claim 15".

On page 10, line 30, cancel "advantageous".

On page 11, cancel lines 1-6, and substitute the following therefor:

--Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Preferred Embodiments and the Drawings.

DESCRIPTION OF THE DRAWINGS--

On page 11, cancel lines 8-12, and substitute the following paragraph therefor:

--Figures 1A and 1B show a cellular arrangement, which represents a network planning result, in a wire-free communications system or a communications network in a supply region;--.

On page 11, cancel lines 14-26, and substitute the following paragraph therefor:

--Figures 2A and 2B show a cross-correlation matrix based on non-orthogonal CDMA codes which can be allocated to the cells in the wire-free communications system, and a required function which is optimized in accordance with the method of the present invention, such that allocation is achieved with minimum transmission influence between the available CDMA codes and the individual cells of the communications system;--.

On pages 11 and 11a, cancel lines 28-37 and 1-3, respectively, and substitute the following paragraph therefor:

--Figures 3A through 3C show a first result of an initial start-up assignment, in accordance with the method of the present invention, of the available CDMA codes to the cells in the communications system, and a start value, which represents the result of the required function, based on the initial start-up assignment of CDMA codes, with the respective function components of the required function, which represent an optimization aim which can be weighted;--.

On page 11a, cancel lines 5-8, and substitute the following paragraph therefor:

--Figure 4 shows a basic sequence of a combinational optimization algorithm, "Simulated Annealing," whose inner loop is repeated iteratively; and--.

On pages 11a and 12, cancel lines 10 and 1-8, respectively, and substitute the following paragraph therefor:

--Figures 5A through 5C show a final allocation result, in accordance with the method of the present invention, of CDMA codes to the cells or base stations in the communications network, and the final result of the required functions, based on the final allocation of the CDMA codes to the cells in the communications network.--.

On page 12, before line 2, insert the following centered heading:

--**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**--.

On page 12, line 2, cancel "arrangement" and substitute therefor --system--.

On page 12, line 3, insert –which-- after "and".

On page 12, line 6, cancel the "-" and substitute therefor a --;--.

On page 12, line 6, insert a --,-- after "example".

On page 12, line 8, cancel "has".

On page 12, line 8, insert –has-- after "already".

On page 12, line 9, cancel "any more" and substitute therefor --further--.

On page 12, line 11, cancel "or cells".

On page 12, lines 12-13, cancel ", in this exemplary embodiment,".

On page 12, line 14, cancel "with" and substitute therefor --having--.

On page 12, line 21, cancel "figure" and substitute therefor --Figure--.

On page 12, line 23, cancel "figure" and substitute therefor --Figure--.

On page 12, line 25, cancel "figure" and substitute therefor --Figure--.

On page 12a, line 3, cancel "figure" and substitute therefor --Figure--.

On page 12a, line 7, cancel "figure" and substitute therefor --Figure--.

On page 13, line 1, cancel "figure" and substitute therefor --Figure--.

On page 13, line 9, cancel "figure" and substitute therefor --Figure--.

On page 13, line 16, cancel "figure" and substitute therefor --Figure--.

On page 13, lines 16-17, cancel "-, with the" and substitute therefor --. The--.

On page 13, line 17, cancel "being" and substitute therefor --is--.

On page 13, line 17, insert a --,-- after "possible".

On page 13, line 30, cancel "figure" and substitute therefor --Figure--.

On page 13, line 34, cancel the "," and substitute therefor a --;--.

On page 13, line 35, cancel "to say" and substitute therefor --,--.

On page 14, line 11, insert a --,-- after "KA".

On page 14, line 13, insert a --,-- after "also".

On page 14, line 13, insert a --,-- after "cases".

On page 14, line 14, cancel "figure" and substitute therefor --Figure--.

On page 14, line 16, cancel the "-" and substitute therefor a --;--.

On page 14, line 16, cancel "to say" and substitute therefor a --,--.

On page 14, line 18, cancel the "-".

On page 14, line 21, insert –present-- before "invention".

On page 14, line 24, insert –which-- after "and".

On page 14, line 25, cancel "figure" and substitute therefor --Figure--.

On page 14, line 29, cancel "according to" and substitute therefor --of--.

On page 14, line 29, insert –present--before "invention".

On page 15, line 2, cancel "figure" and substitute therefor --Figure--.

On page 15, line 7, cancel "according to" and substitute therefor --of--.

On page 15, line 7, insert –present-- before "invention".

On page 15, line 14, cancel "Figure" and substitute therefor --Figures--.

On page 15, line 14, cancel "figure".

On page 15, line 26, cancel "figure" and substitute therefor --Figure--.

On page 15, line 29, cancel "figure" and substitute therefor --Figure--.

On page 15, line 31, insert –present-- before "invention".

On page 15, line 32, cancel ", with the" and substitute therefor --. The--.

On page 15, line 32, insert a --,-- after "and".

On page 15, line 32, insert a --,-- after "thus".

On page 15, line 33, cancel "being" and substitute therefor --is--.

On page 15, line 34, cancel "according to the invention".

On page 15a, line 3, cancel "figure" and substitute therefor --Figure--.

On page 16, line 6, cancel the "-" and substitute therefor a --,--.

On page 16, line 8, cancel the "-" and substitute therefor a --,--.

On page 16, line 10, cancel "figure" and substitute therefor --Figure--.

On page 16, line 11, cancel "that is to say" and substitute therefor --or--.

On page 16, line 22, cancel "figure" and substitute therefor --Figure--.

On page 16, line 29, cancel "figure" and substitute therefor --Figure--.

On page 16, line 32, cancel "figure" and substitute therefor --Figure--.

On page 16, line 34, cancel "figure" and substitute therefor --Figure--.

On page 16a, line 1, cancel the "-" and substitute therefor a --(--.

On page 16a, line 2, cancel the "-" and substitute therefor a --)--.

On page 17, line 2, cancel "figure" and substitute therefor --Figure--.

On page 17, line 3, cancel "according to" and substitute therefor --of--.

On page 17, line 3, insert –present-- before "invention".

On page 17, line 4, cancel "; this" and substitute therefor --. This--.

On page 17, line 5, cancel the ",".

On page 17, line 7, cancel "can".

On page 17, line 7, insert –can-- after "advantageously".

On page 17, line 7, cancel "means of".

On page 17, line 9, cancel "can".

On page 17, line 9, insert –can-- after "also".

On page 17, line 13, cancel "arrangement" and substitute therefor --system--.

On page 17, line 14, cancel "according to" and substitute therefor --of--.

On page 17, line 15, insert –present-- before "invention".

On page 17, line 15, cancel "can".

On page 17, line 15, insert –can-- after "also".

On page 17, line 17, cancel the "-" before "not" and substitute therefor a --(--.

On page 17, line 17, cancel the "-" after "shown" and substitute therefor a --)--.

On page 17, line 18, cancel ", in which" and substitute therefor --. In such--.

On page 17, line 18, insert a --,-- after "case".

On page 17, line 19, cancel "have".

On page 17, line 20, insert –have-- before "been".

On page 17, line 20, cancel the "-" and substitute therefor a --,--.

On page 17, line 21, cancel the "-" and substitute therefor a --,--.

On page 17, line 21, cancel the ",".

On page 17, line 23, cancel the "-" and substitute therefor a --,--.

On page 17, line 24, cancel the "-" and substitute therefor a --,--.

On page 17, line 24, cancel "being" and substitute therefor --is--.

On page 17, line 33, cancel "figure" and substitute therefor --Figure--.

On page 17, line 34, cancel the "-" after "flag" and substitute therefor a --,--.

On page 17, line 34, cancel the "-" after "bit" and substitute therefor a --,--.

On page 17a, line 1, cancel "may".

On page 17a, line 1, insert –may-- after "also".

On page 18, line 2, cancel the "-" and substitute therefor a --;--.

On page 18, line 2, insert a --,-- after "example".

On page 18, line 3, cancel "figure" and substitute therefor --Figure--.

On page 18, line 15, cancel "arrangement" and substitute therefor --system--.

On page 18, line 19, cancel "according to" and substitute therefor --of--.

On page 18, line 19, insert –present-- before "invention".

On page 18, line 25, cancel "have".

On page 18, line 25, insert –have-- after "already".

On page 18, after line 26, insert the following paragraph:

--Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.--

On page 25 (last page), cancel all lines of text and substitute the following therefor:

--ABSTRACT OF THE DISCLOSURE

A method for allocating at least one value of at least one transmission parameter to cells in a communications system having m cells wherein each of the m cells in the communications system is randomly allocated at least one value of at least one transmission parameter. The number of currently allocated, different values and their allocation to the respective cells are varied until the mutual transmission influence of all the adjacent cells has a minimum overall disturbance value. This allows planning of wire-free communications networks, in particular, to be carried out with minimum effort, optimized with regard to time and cost, and without errors.

In the Claims:

On page 19, cancel line 1, and substitute the following left-hand justified heading therefor:

--**We Claim As Our Invention:**--.

Please cancel claims 1-15, without prejudice, and substitute the following claims therefor:

16. A method for allocating at least one CDMA code, wherein n different CDMA codes are available, which can be used in the course of a CDMA

multiple access method, to cells in a communications system having m cells, the method comprising the steps of:

detecting adjacent cells;

allocating, randomly, at least one CDMA code to each cell;

determining for respectively adjacent cells a disturbance value which represents a mutual transmission influence of the currently allocated CDMA codes;

determining an overall disturbance value which represents a total of all the determined disturbance values; and

varying a number of different CDMA codes and their allocation to the respective cells until a minimum overall disturbance value is reached.

17. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the steps of:

determining for respectively non-adjacent cells a further disturbance value which represents the mutual transmission influence of the currently allocated CDMA codes; and

forming the overall disturbance value from a total, which can be weighted, of all the disturbance values and all the further disturbance values.

18. A method for allocating at least one CDMA code to cells in a communication system as claimed in claim 16, the method further comprising the steps of:

adding at least one further cell to the m cells in the communications system;

remaining allocated those CDMA codes which have already been allocated to the m cells; and

varying the total number of the CDMA codes which have been allocated overall to the m cells and to the at least one further cell which is added, and varying the allocation of at least one CDMA code to the at least one cell which is added, until the minimum overall disturbance value is reached.

19. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the steps of:

varying the total number of CDMA codes and the allocation of the CDMA codes to the respective cells by iterative optimization;

representing, as the total of all the disturbance values, a first function component of a required function, wherein the first function component is an optimization aim which can be weighted; and

optimizing the optimization aim in the course of the iterative optimization process such that the total of all the disturbance values reaches the minimum overall disturbance value and the required function reaches an optimum function value.

20. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 19, the method further comprising the steps of:

representing, as a second function component of the required function, an optimization aim which can be weighted and via which the total number of the different CDMA codes which currently have been allocated to all the cells is detected;

representing, as a third function component of the required function, an optimization aim which can be weighted and via which the total number of identical CDMA codes which currently are allocated to respectively adjacent cells is detected; and

allocating to the cells, in the course of the iterative optimization process, a minimum total number of different CDMA codes wherein, if possible, adjacent cells do not have identical CDMA codes.

21. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the step of:

allocating at least one CDMA code to a central communications device arranged in one cell.

22. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the step of:

representing, as the at least one CDMA code which can be allocated to a cell, one of an orthogonal and a non-orthogonal CDMA code which can be used in the course of a CDMA multiple access method.

23. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the step of:

determining a cross-correlation of the currently allocated CDMA codes in each case in order to determine the respective disturbance values which represent the mutual transmission influence of the currently allocated CDMA codes, wherein the overall disturbance value represents the total of all the determined cross-correlations.

24. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 23, the method further comprising the step of:

representing, as the total of all the determined cross-correlations, the first function component of the required function wherein, in the course of the iterative optimization process, the optimization aim of the required function which can be weighted is optimized such that the total of all the cross-correlations reaches a minimum overall value.

25. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 20, the method further comprising the steps of:

representing, as the total number of the CDMA codes which have been allocated, the second function component; and

representing, as the total number of identical CDMA codes which are currently allocated to respectively adjacent central communications units, the third function component, wherein, in the course of the iterative optimization process, the optimization aims of the required function are optimized such that the minimum number of different CDMA codes are allocated to the central communications units and, if possible, adjacent central communications units do not have CDMA codes of the same type.

26. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 19, wherein the iterative optimization process is carried out in the course of a known combinational optimization method such as one of simulated annealing, using neural networks, and by genetic algorithms.

27. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, the method further comprising the steps of:

allocating to one of the cells and the central communications units, at least one of orthogonal CDMA codes and pseudo-random CDMA codes; and

deriving further communications-unit-specific CDMA codes from the allocated CDMA codes.

28. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 19, the method further comprising the steps of:

adding at least one further cell to the communications system;

keeping allocated the already allocated CDMA codes; and

selecting weightings of the optimization aims of the required function such that in the course of the iterative optimization process the further cells are allocated only a minimum number of the available CDMA codes which have not yet been allocated, with the total of the determined cross-correlations having a minimum overall value.

29. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, wherein the allocation of the at least one CDMA code is carried out by software.

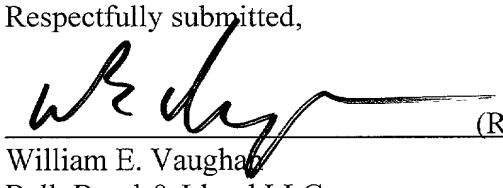
30. A method for allocating at least one CDMA code to cells in a communications system as claimed in claim 16, wherein the communications system is formed by at least one of a cellular communications network, a wire-based communications network, a cable-based communications network, and a wire-free communications network.

REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification in order to conform the specification to the requirements of the United States Patent practice. No new matter is added thereby. Original claims 1-15 have been canceled in favor of new claims 16-30. However, claims 16-30 have been presented solely because the revisions by bracketing and underlining which would have been necessary in claims 1-15 in order to conform those claims to the requirements of United States Patent practice would have been too extensive, and thus would have been too burdensome. The cancellation of claims 1-15 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-15.

Early consideration on the merits is respectfully requested.

Respectfully submitted,



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BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS: Dr. Carsten Ball et al.	DOCKET NO: 112740-137
SERIAL NO:	GROUP ART UNIT:
	EXAMINER:
INTERNATIONAL APPLICATION NO:	PCT/DE99/01491
INTERNATIONAL FILING DATE:	18 May 1999
INVENTION:	METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In The Specification:

On page 1, cancel lines 1-5 and substitute the following therefor:

--SPECIFICATION

TITLE PLEASE INSERT NEW TITLE

METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

BACKGROUND OF THE INVENTION

Field of the Invention

Description

Method for allocating at least one value of at least one transmission parameter to cells in a communications arrangement having m cells

In wire-free communications networks based on radio channels, in particular for point-to-multipoint radio feeder networks - also referred to as "radio in the local loop" or "RLL" - a number of network termination units are each connected via one or more radio channels to a base station - also referred to as a "radio base station" or "RBS". Telcom Report No. 18 (1995), issue 1 "Drahtlos zum Freizeichen" [Ringing without wires], pages 36, 37, for example, describes a wire-free feeder network for wire-free voice and data communication. The described communications system represents an RLL subscriber connection in conjunction with a modern broadband infrastructure - for example "fiber to the curb" - which can be produced in a short time and without major effort, instead of laying wire-based connecting lines. The network termination units RNT - Radio Network Termination - allocated to the individual subscribers are connected via the "radio channel" transmission medium and the base station RBS to a higher-level communications network, for example to the ISDN-based landline network.

As multimedia applications become increasingly widespread, high bit-rate data streams must be transmitted quickly and reliably via communications networks, in particular via wire-free communications networks or via mobile radio systems. Particularly with regard to the air interface, this necessitates the use of methods which can be implemented only with a great deal of effort, both technically and financially, for controlling access to the transmission medium, as well as complex methods for multiplexing, coding and

modulation of the signals. For example, to provide the future third generation mobile communications systems, the cellular

mobile radio, cordless telephone and radio paging systems, which are currently still separate, for voice and/or data transmission are combined in a universal mobile communications system - also referred to as UMTS (Universal Mobile Telecommunications System) - thus allowing an increased range of services and standard terminals. To achieve this, a region which is to be supplied and covers a large area - for example Europe - is split, in a similar way to that for cellular mobile radio, into partially overlapping radio cells of different sizes - for example into macro, micro and pico cells - in order to use the available frequency spectrum to cover the switching and transmission resources requirement, which differs widely depending on the subregion - for example within a city or a rural region. Each radio cell is allocated a base station which is connected via the "radio channel" wire-free transmission medium to a number of decentralized communications devices such as mobile stations or wire-free network termination units. In order to allow bidirectional information transmission between the base station and a decentralized communications device arranged in a radio cell in a wire-free communications arrangement, a duplex link is in each case set up between a decentralized communications device and a central base station, with the FDD method - "Frequency Division Duplex" - or the TDD method - "Time Division Duplex" - being used as the current duplexing method for bidirectional information transmission. Multiple access methods, such as FDMA - Frequency Division Multiple Access -, TDMA - Time Division Multiple Access - and CDMA - Code Division Multiple Access - are used to control access to the jointly used "radio channel" transmission medium by the central and decentralized communications devices arranged in a wire-free communications arrangement. Furthermore, combinations of said multiple access methods - also referred to as

hybrid methods - such as the TD/CDMA access method, are known

for use in future wire-free communications arrangements.

In contrast to the FDMA and TDMA multiple access method, the CDMA multiple access method allows all the communications devices and subscribers arranged in a radio cell or cell in the wire-free communications arrangement to use the same frequency band at the same time. To allow the subscriber signals transmitted by the individual communications devices to be separable at the receiver end, these signals are spread spectrally, that is to say they are transformed in a broadband spectral band. One method for spectral spreading is, for example, the DS principle "Direct Sequence" which is frequently used in present-day mobile communication and in which each narrowband subscriber signal at a low bit rate is multiplied, for spectral spreading, by a broadband spreading function which is allocated individually to the subscriber and is also referred to as the CDMA code. The broadband signal which results from this contains the narrowband user signal or subscriber signal and an individual fine structure, using which the user signal or subscriber signal can be separated at the receiver end from the other superimposed, broadband transmission signals.

During network planning or network expansion of code-selective radio systems, that is to say when implementing wire-free cellular communications networks using the CDMA multiple access method, each base station or central communications device which produces a radio cell must be allocated a base-station specific CDMA code which represents a spreading function. A CDMA code allocated to a base station is also referred to as a CDMA basic code or CDMA code name since this is in each case used to derive those cell-specific CDMA codes which are allocated to the decentralized communications devices arranged in the respective radio cell in order

to provide radio channels when setting up a link. The CDMA basic codes and the

CDMA codes derived from the CDMA basic codes and used for the CDMA multiple access method within the radio cell may represent both orthogonal and non-orthogonal CDMA codes, in which case orthogonal CDMA codes are independent of one another - that is to say the value of the cross-correlation between two orthogonal CDMA codes has the value 0 - ; non-orthogonal CDMA codes have a cross-correlation which differs slightly from the value 0.

When producing or expanding wire-free cellular communications networks based on a CDMA multiple access method, the CDMA basic codes, of which only a limited number are available, must be distributed between the base stations arranged in the radio cells and must be allocated to the individual radio cells of the wire-free communications device.

By way of example, European Patent Specification 0 681 776 describes a method for assigning frequencies, which in each case represent values of a transmission parameter, to base stations in a mobile radio network, which method assumes input information comprising at least the number of frequencies required for each base station, the frequencies which may be used in the mobile radio network, and information relating to possible disturbance effects between the base stations in the event of associated, identical and/or adjacent frequencies. In the course of frequency assignment runs, which have to be carried out a number of times, one base station is in each case selected from the set of those base stations to which all the frequencies which have been provided have not yet been assigned, with the base station being selected on the basis of a first base station selection criterion and, if necessary, further base station selection criteria. Depending on the selected base station, a frequency is selected using a first frequency selection criterion

and, if necessary, further frequency selection criteria, and is then assigned to the selected base station. The frequency

assignment runs are repeated until all the base stations are allocated the required number of frequencies, taking account of all the secondary conditions such as the base station and frequency selection criteria.

The invention is based on the object of improving the provision and planning of wire-free communications networks, in particular of cellular communications networks based on a CDMA multiple access method, and on providing expansion of such communications networks. The object is achieved by the features of patent claim 1.

The major aspect of the method according to the invention for allocating at least one value of at least one transmission parameter to cells in a communications arrangement having m cells, with n different values of the at least one transmission parameter being available, is that adjacent cells are detected and each cell is in each case randomly allocated at least one value of the at least one transmission parameter. A disturbance value which represents the mutual transmission influence of the currently allocated values of the at least one transmission parameter is in each case determined for respectively adjacent cells, and an overall disturbance value which represents the total of all the disturbance values is then determined. The number of different values of the at least one transmission parameter and their allocation to the respective cells are varied until a minimum overall disturbance value is reached.

The major advantage of the method according to the invention is that it achieves very rapid allocation of values of at least one transmission parameter to cells in a communications arrangement with minimal financial and technical effort and in which case, advantageously, there is no need to determine or

evaluate any secondary conditions or selection criteria in advance. Advantageously, no planning considerations or subsequent further processing of considerations which have been defined in the documentation are required, so that communications arrangements, in particular wire-free cellular communications networks, can be planned cost-effectively and optimized with respect to time using simple means. Furthermore, the method according to the invention minimizes the probability of incorrect assignments of values of a transmission parameter to the cells in the communications arrangement, and this advantageously improves the functionality and operational reliability of the communications arrangement to be provided. The method according to the invention also allows values of a number of transmission parameters to be allocated to the cells in the communications arrangement.

One additional advantage of the method according to the invention is that a further disturbance value, which represents the mutual transmission influence of the currently allocated values of the at least one transmission parameter, is also in each case determined for respectively non-adjacent cells, and the overall disturbance value which represents the total of all the disturbance values is then formed from the total, which can be weighted, of all the disturbance values and the further disturbance values - claim 2. In this advantageous refinement, the process of allocating values of the at least one transmission parameter to the m cells in the communications arrangement also takes account of the mutual transmission influence or disturbance between non-adjacent cells, thus further improving and optimizing the allocation of values of the at least one transmission parameter to the m cells in the communications arrangement, and thus further minimizing

the susceptibility of the overall communications arrangement to disturbances.

According to one advantageous development of the method according to the invention, when at least one further cell is added to the m cells in the communications arrangement, the

allocation of at least one value of the at least one transmission parameter is carried out in such a way that those values of the at least one transmission parameter which have already been allocated to the m cells remain allocated. The total number of those different values of the at least one transmission parameter which have been allocated overall to the m cells and to the at least one cell which is added, and the allocation of at least one value to the at least one cell which is added, are varied until a minimum overall disturbance value is reached - claim 3. This advantageous development advantageously allows the method according to the invention to be used both for planning a network layout - that is to say initial assignment of a value of at least one transmission parameter to the m cells in the communications arrangement - and for planned network expansion - that is to say when adding at least one further cell to the already existing m cells in the communications arrangement.

The total number of values of the at least one transmission parameter and their allocation to the respective cells are advantageously varied using an iterative optimization process, in which case the total of all the disturbance values represents a function component of a required function, which function component represents an optimization aim which can be weighted. In the course of the iterative optimization process, the optimization aim (which can be weighted) of the required function is optimized in such a way that the total of all the disturbance values reaches a minimum overall disturbance value, and the required function reaches an optimum or minimum function value - claim 4. During the iterative optimization process, known and proven optimization strategies can advantageously be used for allocation of values of the at least one transmission parameter to the m cells in

the communications arrangement. Examples of optimization strategies for iterative optimization processes are simulated annealing, genetic algorithms or else neural networks (Hopfield Networks) - claim 12. Iterative optimization processes are, for example, used as standard for combinational optimization problems when designing layouts of integrated circuits and are

advantageously used when planning and expanding communications networks by means of the method according to the invention. Such algorithms for producing optimization strategies are described, for example, in the following documents:

- "Adaption in natural and artificial systems", J.H. Holland, second printing, MIT-Press, Cambridge, 1992,
- "Genetic algorithms in search, optimization and machine learning", D.E. Goldberg, Addison Wessley Publishing Company, Massachusetts, 1989,
- "Optimization by simulated annealing", S. Kirkpatrick, C.D. Gelatt, M.P. Vecchi, Science, Vol. 220, No. 4598, 1983.

According to one advantageous development, the required function has a further function component which represents an optimization aim which can be weighted and by means of which the total number of those different values of the at least one transmission parameter which have currently been allocated to all the cells is detected. Furthermore, the required function may have a further function component which represents an optimization aim which can be weighted and by means of which the total number of identical values of the at least one transmission parameter which are currently allocated to respectively adjacent cells is detected. Subsequently, in the course of the iterative optimization process, the optimization aims which can be weighted are weighted in such a manner, and the required function is optimized in such a manner, that the cells are allocated a minimum total number of different values of the at least one transmission parameter, and/or that, if possible, adjacent cells do not have identical values of the at least one transmission parameter - claim 5. Expansion of the required function by further function components

which each represent an optimization aim which can be weighted allows the allocation of values of the at least one transmission parameter to the m cells of the communications arrangement to be improved and a refinement of the optimization strategy to be achieved, since, advantageously, further transmission secondary conditions can be taken into account in the planning and expansion of communications networks. As a result of suitable weighting of the

individual function components of the required function, the allocation of values of the at least one parameter is advantageously carried out in the course of the iterative optimization process in such a way that the total number of those different values of the at least one transmission parameter which are currently allocated to all the cells is a minimum and, at the same time, adjacent cells are not allocated identical values of the at least one transmission parameter. This results in optimum allocation of values of the at least one transmission parameter to the m cells in the communications arrangement, that is to say minimum mutual interference between adjacent values of the at least one transmission parameter, and thus minimum susceptibility to disturbances during use of the communications arrangement.

At least one value of the at least one transmission parameter is, for example, allocated to a central communications device which is arranged in one cell - claim 6. The central communications device may, for example, be in the form of a base station arranged in a radio cell in a mobile radio communications network.

That value of the at least one transmission parameter which can in each case be allocated to a cell may, for example, represent a transmission frequency or a transmission frequency band - claim 7 - or an orthogonal or non-orthogonal CDMA code which can be used in the course of a CDMA multiple access method - claim 8. The method according to the invention can advantageously be used both for network planning or start-up initialization and for communications network expansion of wire-free communications networks, in which case, for example, one or more transmission frequencies or transmission frequency bands can be allocated in a particularly simple and cost-effective manner to a cell which is arranged in the wire-free

communications arrangement. For example, the method according to the invention can be used for planning and configuration of mobile communications systems, in particular of mobile communications systems to the UMTS standard or of

wire-free subscriber access networks based on a CDMA multiple access method, in which orthogonal or non-orthogonal CDMA codes or CDMA basic codes can be allocated to base stations in a very simple and cost-effective manner.

Furthermore, the cross-correlation of the currently allocated CDMA codes is in each case determined in order to determine the respective disturbance values which represent the mutual transmission influence of the currently allocated CDMA codes, with the overall disturbance value representing the total of all the determined cross-correlations - claim 9. Calculation of the cross-correlation of adjacent CDMA codes allows the respective transmission influence of the currently allocated CDMA codes to be determined in a very simple manner, thus further simplifying the implementation of the method according to the invention.

According to one advantageous refinement, orthogonal and/or pseudo-random CDMA codes are allocated to the central communications units, with further communication-unit-specific codes being derived from the allocated CDMA codes - claim 13. Minimum intercellular interference between the cells in the communications arrangement is achieved by deriving communications-unit-specific codes from the "optimally" allocated CDMA codes or CDMA basic codes.

The allocation of the at least one value of the at least one transmission parameter is advantageously carried out by software - claim 15. This advantageous refinement allows values of the at least one transmission parameter to be allocated automatically and optimized with respect to time, with the capability to store the results obtained in a generally legible data format, so that they can be processed further by other computer programs that assist network planning.

Further advantageous refinements of the method according to the invention can be found in the further claims.

The method according to the invention will be explained in more detail in the following text with reference to a number of drawings, in which:

Figure 1A and Figure 1 B — show a cellular arrangement, which represents a network planning result, in a wire-free communications arrangement or a communications network in a supply region,

Figure 2A and Figure 2B — show a cross-correlation matrix based on non-orthogonal CDMA codes which can be allocated to the cells in the wire-free communications arrangement, and a required function, which is optimized in the course of the method according to the invention in such a way that optimum allocation is achieved, that is to say allocation with the minimum transmission influence between the available CDMA codes and the individual cells of the communications arrangement,

Figure 3A to Figure 3C — show a first result of an initial start-up assignment, carried out in the course of the method according to the invention, of the available CDMA codes to the cells in the communications arrangement, and a start value, which represents the result of the required function, based on the initial start-up assignment of CDMA codes, with the respective function components of the

required function, which represent an optimization aim which can be weighted, also being shown,

Figure 4 shows a basic sequence of a combinational optimization algorithm - "Simulated Annealing" - whose inner loop is repeated iteratively,

Figure 5A show a final allocation result, which

to Figure 5C represents the result of the method according to the invention, of CDMA codes to the cells or base stations in the communications network, and the final result of the required functions, based on the final allocation of the CDMA codes to the cells in the communications network.

Figure 1A shows a communications arrangement KA which is arranged in a supply region and, in this exemplary embodiment, represents a wire-free communications network based on a CDMA multiple access method - for example a wireless local loop system "WLL" based on CDMA technology. As a result of network planning, which has already been carried out and will not be explained in any more detail, the wire-free communications network is subdivided into four radio cells or cells Z1...4, for example depending on the terrain characteristics of the supply region, with, in this exemplary embodiment, a central communications device or base station BS1...4 with, for example, integrated omnidirectional antennas being arranged in each cell Z1...4. The dimensions and the respective arrangement of the individual cells Z1...4 and the positioning of a base station BS1...4 within a cell Z1...4 are defined accurately by the result of the network planning which has already been carried out, and are illustrated in figure 1A. The topology of the wire-free communications network KN illustrated in figure 1A, and the arrangement of the individual cells Z1...4 of the communications network KN are shown in an adjacency graph G which is illustrated in figure 1B, with each base station BS1...4 corresponding to one, and only one, node K1...4 in the adjacency graph G. Each edge, which connects two respective nodes K1...4, in the adjacency graph G in each case represents two

adjacent cells Z1...4 or base stations BS1...4 which, at least partially, have a common boundary profile. For example, as shown in figure 1B, the first and the fourth nodes K1,4 are connected by one edge and, in consequence, the first and the fourth base stations BS1,4 are identified as being adjacent. In a corresponding way, figure 1A shows the common boundary profile between the first and the fourth

cells Z1,4. Furthermore, as shown in figure 1B, the first and the second base stations BS1,2, together with the second and fourth base stations BS2,4 and the second and third base stations BS2,3 are identified as being adjacent. No edge is arranged in the adjacency graph G between the first and the third nodes K1,3, since the first and the third cells Z1,3 and the wire-free communications network KA do not have any common boundary profile - see figure 1A.

In order to allow optimum operation, that is to say disturbance-free operation, of the communications network KA designed using a CDMA multiple access method, each base station BS1...4 arranged within a cell Z1...4 in the CDMA communications network KA must be allocated one or more base-station-specific CDMA codes or CDMA basic codes c1...7 - see figure 2A -, with the aim being as far as possible to avoid or minimize any mutual influence or interference between CDMA codes c1...7 allocated to adjacent cells Z1...4. By way of example, the following text describes the allocation of one, and only one, CDMA code c1...7 to a base station BS1...4. The CDMA codes c1...7 must be allocated to the cells Z1...4 in the CDMA communications network KA in such a way that the value of the intercellular noise which represents the mutual interference between the CDMA codes c1...7 is a minimum. In this exemplary embodiment, seven global, non-orthogonal CDMA codes C1...7 are available for configuration of the CDMA communications network KN illustrated in figure 1A, and these are at least partially intended to be distributed optimally to the base stations BS1...4 arranged in the CDMA communications network KA in the course of an initial code assignment process, that is to say during the initial assignment of CDMA codes c1...7 which represents the setting up of the network.

Figure 2A illustrates the cross-correlation matrix KC, which is symmetrical about the main diagonal, of the CDMA codes c1...7 to be allocated in this exemplary embodiment, with each cross-correlation value

kc1_1...kc7_7 represented in the cross-correlation matrix KC in each case representing the mutual influence, dependency or interference between two CDMA codes c1...7. The values kc1_1, kc2_2, ..., kc7_7 arranged on the main diagonal of the cross-correlation matrix KC each have the value 1, since identical CDMA codes c1...7 each have a maximum dependency or correlation. Since, in this exemplary embodiment, both orthogonal and non-orthogonal CDMA codes are to be allocated to the individual cells Z1...4 in the CDMA communications network KA those correlation values which are not arranged on the main diagonal of the cross-correlation matrix KC also in some cases have a value other than 0. For example, as shown in figure 2A, the first and the fifth CDMA codes c1,5 have no dependencies - that is to say the first and the fifth CDMA codes c1,5 are orthogonal with respect to one another - and, in consequence, the corresponding value kc1_5 in the cross-correlation matrix KC has the value 0.

According to the invention, the available CDMA codes c1...7 are allocated to the respective cells Z1...4 in the CDMA communications network KA using a required function E which is to be optimized and is illustrated in figure 2B. In this exemplary embodiment, the required function E has three function components f1...3, which each represent an optimization aim which can be weighted and are each improved iteratively in the course of the method according to the invention by using a combinational optimization algorithm, so that the required function E is optimized overall. The first function component f1, which is weighted with a first weighting factor k1, is used to detect the number of different CDMA codes c1...7 allocated to the cells Z1...4 in one allocation step. Furthermore, a function

component f2, which is weighted with a second weighting factor k2, in the required function E defines the number of identical allocated CDMA codes c1...7 in adjacent cells Z1...4, and a function component f3, which is weighted with a third weighting factor k3, in the required function E forms the total of those cross-correlation values c1_1...c7_7 of allocated CDMA codes

c1...7 which are arranged in adjacent cells Z1...4 in the CDMA communications network KA. According to figure 2B, the first weighting factor k1 has the value k1 = 1000, the second weighting factor k2 has the value k2 = 2000, and the third weighting factor k3 has the value k3 = 1000.

Based on the method according to the invention, the available CDMA codes c1...7 are allocated randomly to the cells Z1...4 or base stations BS1...4 in the CDMA communications network KA in a first allocation step, which is referred to as the initial allocation. The random allocation of the CDMA codes c1...7 may be carried out, for example, using a random-selection method. Figure 3A and figure 3B show the result of the initial allocation of CDMA codes c1...7 to the base stations BS1...4 in the communications network KA, and to the nodes K1...4 in the adjacency graph G. After the first, initial allocation step, the first base station BS1 is allocated the fifth CDMA code c5, the second base station BS2 is allocated the sixth CDMA code c6, the third base station BS3 is allocated the second CDMA code c2, and the fourth base station BS4 is likewise allocated the second CDMA code c2. Figure 3C shows, in a self-explanatory manner, the result of the required function E, based on the initial allocation of the CDMA codes c2,5,6 illustrated in figure 3A, with the origin of the results of the individual function components f1...3 being shown in more detail. The value of the required function E illustrated in figure 3C and based on the initial allocation represents, according to the invention, the start value of the required function E = 6260, with the required function and thus the start value being iteratively improved or optimized in the course of the method according to the invention by using the combinational optimization algorithm which is referred to as "simulated annealing". A fundamental

"simulated annealing" sequence is shown in a self-explanatory manner in the form of a flowchart in figure 4.

The combinational optimization algorithm is repeated, that is to say the number and the allocation of the CDMA codes

c1...7 are varied in such a way, until the required function E, and/or the respective function components f1...3 of the required function E which represent an aim which can be weighted, are optimized and a termination criterion which can be predetermined is reached. On reaching the termination criterion - for example when the required function E reaches a minimum final value - the current allocation of at least some of the available CDMA codes c1...7 is stored as the final result. By way of example, figure 5A shows the final, that is to say "optimum" allocation of CDMA codes c1...7 to the base stations BS1...4 in the form of a table, with this allocation having been determined using the combinational optimization algorithm. According to the optimum allocation, the first base station BS1 is allocated the fifth CDMA code c5, the second base station BS2 is allocated the first CDMA code c1, the third base station BS3 is allocated the fifth CDMA code c5, and the fourth base station BS4 is allocated the sixth CDMA code c6. The final allocation of the CDMA codes c1,5,6 is likewise shown in the adjacency graph G illustrated in figure 5B. Figure 5C shows the corresponding required function E based on the determined, "optimum" allocation of the CDMA codes c1,5,6 to the base stations BS1...4, with the partial results for the three function components f1...3 of the required function E being explained in more detail. The final value of the required function E = 3040, which is illustrated in figure 5C and at the same time represents the termination criterion, in this case represents the minimum value determined by using the combinational optimization algorithm - see figure 3C.

The described method resulted in the communications arrangement KA illustrated in figure 1A, and the base stations BS1...4 arranged in the CDMA communications network, being allocated a minimum

number of different CDMA codes c1...7 - allocation of only three different CDMA codes c1,5,6 - with adjacent base stations BS1...4 or radio cells Z1...4 not having the same or identical CDMA codes c1...7 and, at the same time, the sum of the cross-correlations kc1_1...kc7_7 of the CDMA codes c1,5,6, allocated to adjacent base stations BS1...4,

having a minimum value. The allocation of CDMA codes as shown in figure 5A, which represents the final result of the method according to the invention, thus has the least mutual interference influences; this allocation is thus regarded as the optimum, and is stored in a generally legible data format. The stored final result can advantageously be processed further by means of other computer-based network planning tools.

In addition, the described method can also be used to allocate values for other transmission parameters, such as radio frequencies or frequency bands, to the respective cells Z1...4 in the communications arrangement KA.

In addition, the method according to the invention can also be used during network expansion, that is to say when further radio cells or base stations - not shown - are added to an already existing communications arrangement KA, in which case those values of a transmission parameter which have already been allocated to base stations BS1...4 - for example already allocated CDMA codes c1...7 - remain allocated, and at least one value of the at least one transmission parameter - for example a CDMA code c1...7 or CDMA basic code - being allocated only to the newly added base stations, by using the combinational optimization algorithm in each case. For example, in the event of a network expansion, a stored, optimum result of an allocation is read in, and base stations BS1...4 to which at least one value of the at least one transmission parameter has already been allocated are provided with a marking in the course of the method. A marking can be provided, for example according to one refinement variant indicated in figure 5B, by setting a flag - for example a set bit - in a marking data field mdf or in a marking memory cell which is in each case allocated to one node K1...4 in the adjacency graph G.

Each node K1...4 in the adjacency graph G may also be allocated a further value memory cell wdf for storing the at least one

allocated value of the at least one transmission parameter - for example the allocated CDMA code c1...7 - see figure 5B. Each flag which is allocated to a node K1...4 or to a base station BS1...4 in a marking data field mdf indicates whether a value which is stored in the corresponding value memory cell wdf may be changed in the course of the method. For example, when setting up a network or during initial allocation of values of the at least one transmission parameter, all the marking data fields mdf are erased, and at least one value of the at least one transmission parameter is thus allocated to each node K1...4 and to each base station BS1...4. In the event of a network expansion or when adding further base stations to an already existing communications arrangement KA, the already allocated values of the at least one transmission parameter are read in or loaded, and the flags are set as appropriate in the marking data fields mdf. The method according to the invention results in the added base stations being treated in the same way as when the network is set up. The already allocated values of the at least one transmission parameter are advantageously retained since, for example, a considerable time penalty and financial cost are involved to locally change CDMA codes c1...7 which have already been allocated to base stations.

Patent Claims

1. A method for allocating at least one CDMA code (c1...7), which can be used in the course of a CDMA multiple access method, to cells (Z...4) in a communications arrangement (KA) having m cells,

- in which n different CDMA codes (c1...7) are available,
- in which adjacent cells (Z1...4) are detected,
- in which each cell (Z1...4) is in each case randomly allocated at least one CDMA code (c1...7),
- in which a disturbance value (kc1_1...kc7_7), which represents the mutual transmission influence of the currently allocated CDMA codes (c1...7), is in each case determined for respectively adjacent cells (Z1...4),
- in which an overall disturbance value which represents the total of all the determined disturbance values is determined,
- in which the number of different CDMA codes (c1...7) and their allocation to the respective cells (Z1...4) are varied until a minimum overall disturbance value is reached.

2. The method as claimed in claim 1,

characterized

- in that, in addition, a further disturbance value (kc1_1...kc7_7), which represents the mutual transmission influence of the currently allocated CDMA codes (c1...7), is in each determined for respectively non-adjacent cells (Z1...4), and
- in that the overall disturbance value, which represents the total of all the disturbance

values, is formed from a total, which can be weighted, of all the disturbance values (kc1_1...kc7_7) and the further disturbance values (kc1_1...kc7_7).

3. The method as claimed in one of the preceding claims,
characterized
in that when at least one further cell is added to the m cells (Z1...4) in the communications arrangement (KA), the allocation of a further CDMA code (c1...7) is carried out in such a way

- that those CDMA codes (c1...7) which have already been allocated to the m cells (Z1...4) remain allocated, and
- that the total number of those different CDMA codes (c1...7) which have been allocated overall to the m cells (Z1...4) and to the at least one cell which is added, and the allocation of at least one CDMA code (c1...7) to the at least one cell which is added, are varied until a minimum overall disturbance value is reached.

4. The method as claimed in one of the preceding claims,
characterized

- in that the total number of CDMA codes (c1...7) and their allocation to the respective cells (Z1...4) are varied by iterative optimization,
- in that the total of all the disturbance values represents a function component (f3) of a required function (E), which function component (f3) represents an optimization aim which can be weighted,
- in that, in the course of the iterative optimization process, the optimization aim (which can be weighted) of the required function (E) is optimized in such a way that the total of all the disturbance values reaches a minimum overall disturbance value, and the required function (E) reaches an optimum or minimum function value.

5. The method as claimed in claim 4,
characterized

- in that the required function (E) has a further function component (f1) which represents an optimization aim which can be weighted and by means of which the total number of those different CDMA codes (c1...7) which have currently been allocated to all the cells (Z1...4) is detected, and/or
- in that the required function (E) has a further function component (f2) which represents an

optimization aim which can be weighted and by means of which the total number of identical CDMA codes (c1...7) which are currently allocated to respectively adjacent cells (Z1...4) is detected, and

- in that, in the course of the iterative optimization process, the optimization aims which can be weighted are weighted in such a manner, and the required function (E) is optimized in such a manner,

-- that the cells (Z1...4) are allocated a minimum total number of different CDMA codes (c1...7), and/or

-- that, if possible, adjacent cells (Z1...4) do not have identical CDMA codes (c1...7).

6. The method as claimed in one of the preceding claims,
characterized
in that at least one CDMA code (c1...7) is allocated to a central communications device (BS1...4), which is arranged in one cell (Z1...4).

7. The method as claimed in one of claims 1 to 6,
characterized in that
the at least one CDMA code (c1...7) which can be allocated to a cell (Z1...4) represents an orthogonal or non-orthogonal CDMA code which can be used in the course of a CDMA multiple access method.

8. The method as claimed in one of the preceding claims, **characterized**

- in that the cross-correlation of the currently allocated CDMA codes is in each case determined in order to determine the respective disturbance values (kc1_1...kc7_7) which represent the mutual transmission influence of the currently allocated CDMA codes, and - in that the overall

disturbance value represents the total of all the determined cross-correlations (kc1_1...kc7_7).

9. The method as claimed in claim 8,
characterized
- in that the total of all the determined cross-correlations (kc1_1...kc7_7) represents that function component (f3) of the required function (E) which represents the optimization aim which can be weighted, and
- in that, in the course of the iterative optimization process, that optimization aim of the required function (E) which can be weighted is optimized in such a way that the total of all the cross-correlations (kc1_1...kc7_7) reaches a minimum overall value.

10. The method as claimed in one of claims 5 to 9,
characterized
- in that the number of allocated, different types of CDMA codes (c1...7) represents the further function component (f1) which represents an optimization aim which can be weighted, and/or
- in that the number of identical CDMA codes (c1...7) which are currently allocated to respectively adjacent, central communications units (BS1...4) represents the further function component (f2) which represents an optimization aim which can be weighted,
- in that, in the course of the iterative optimization process, those optimization aims of the required function (E) which can be weighted are optimized in such a way that a minimum number of different CDMA codes (c1...7) are allocated to the central communications units (BS1...4), in which case, if possible, adjacent, central communications units (BS1...4) do not have CDMA codes (c1...7) of the same type.

11. The method as claimed in one of claims 4 to 10, **characterized**
in that the iterative optimization process relating to optimization of the at least one optimization aim of the required function (E) is carried out in the course of a known combinational optimization method such as simulated annealing or using neural networks, or by genetic algorithms.

12. The method as claimed in one of the preceding claims, **characterized**

- in that orthogonal CDMA codes and/or pseudo-random CDMA codes (c1...7) are allocated to the cells (Z1...4) or the central communications units (BS1...4), and
- in that further communications-unit-specific CDMA codes are derived from the allocated CDMA codes (c1...7).

13. The method as claimed in one of claims 4 to 12, **characterized**

- in that, when at least one further cell is added to the communications arrangement (KA), the already allocated CDMA codes (c1...7) remain allocated, and
- in that the weightings (k1...3) of the optimization aims of the required function (E) are selected in such a way

-- that in the course of the iterative optimization process the further cells are allocated only a minimum number of the available CDMA codes (c1...7) which have not yet been allocated, with the total of the determined cross-correlations (kc1_1...kc7_7) having a minimum overall value.

14. The method as claimed in one of the preceding claims, **characterized in that**
the allocation of the at least one CDMA code (c1...7) is carried out by software.

15. The method as claimed in one of the preceding claims, **characterized in that**
the communications arrangement (KA) is formed by a cellular, wire-based or cable-based, or wire-free communications network, or by a combination of said communications networks.

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the allocation of the at least one value (c1...7) of the at least one transmission parameter (C) is carried out by software.

16. The method as claimed in one of the preceding claims, **characterized in that**
the communications arrangement (KA) is formed by a cellular, wire-based or cable-based, or wire-free communications network, or by a combination of said communications networks.

Abstract

Method for allocating at least one value of at least one transmission parameter to cells in a communications arrangement having m cells

Each of the m cells (Z1...4) in a communications arrangement (KA) is randomly allocated at least one value (c1...7) of at least one transmission parameter (C). The number of currently allocated, different values (c1...7) and their allocation to the respective cells (Z1...4) are varied until the mutual transmission influence of all the adjacent cells (Z1...4) has a minimum overall disturbance value. This advantageously allows planning of wire-free communications networks, in particular, to be carried out with minimum effort, optimized with regard to time, cost-effectively and without errors.

FIGURE 2B

FIG 1A

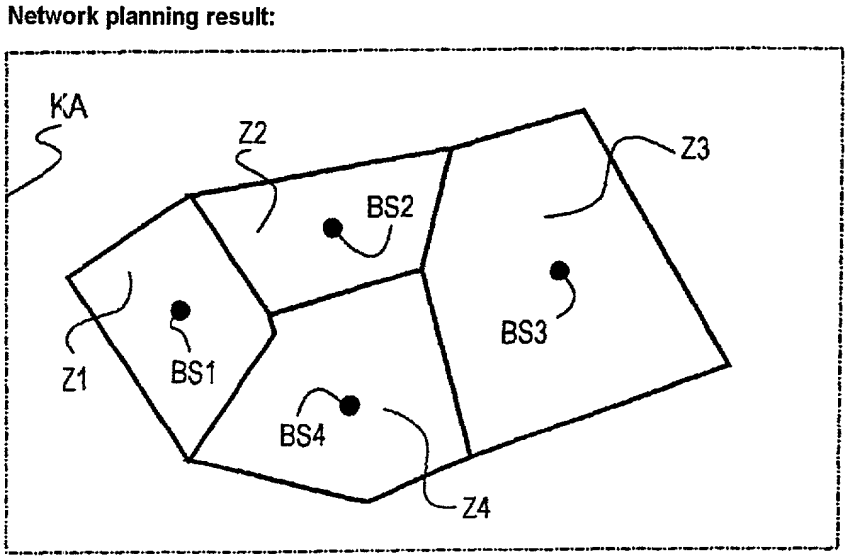

FIG 1B

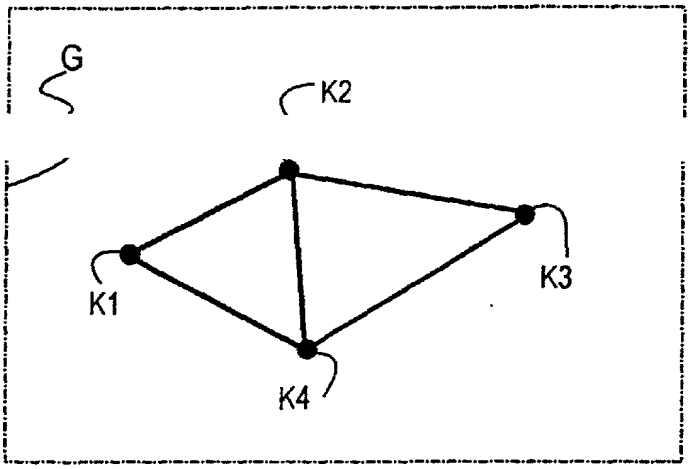

FIG 2A

C = {c1, c2, c3, c4, c5, c6, c7}

KC

kc1_1

CDMA-Codes	c1	c2	c3	c4	c5	c6	c7
c1	1.00	0.01	0.03	0.02	0.00	0.02	0.04
c2	0.01	1.00	0.01	0.00	0.05	0.10	0.08
c3	0.03	0.01	1.00	0.04	0.02	0.03	0.01
c4	0.02	0.00	0.04	1.00	0.04	0.04	0.03
c5	0.00	0.05	0.02	0.04	1.00	0.01	0.01
c6	0.02	0.10	0.03	0.04	0.01	1.00	0.00
c7	0.04	0.08	0.01	0.03	0.01	0.00	1.00

kc1_7

kc7_7

FIG 2B

$$E = k1 * f1 + k2 * f2 + k3 * f3$$

where: k1 = 1000, k2 = 2000, k3 = 1000

f1: Number of CDMA codes used

f2: Number of identical CDMA codes in adjacent cells

f3: Total of the cross-correlations of the CDMA codes of adjacent cells

FIG 3A

Base station	CDMA code
BS1	c5
BS2	c6
BS3	c2
BS4	c2

FIG 3B

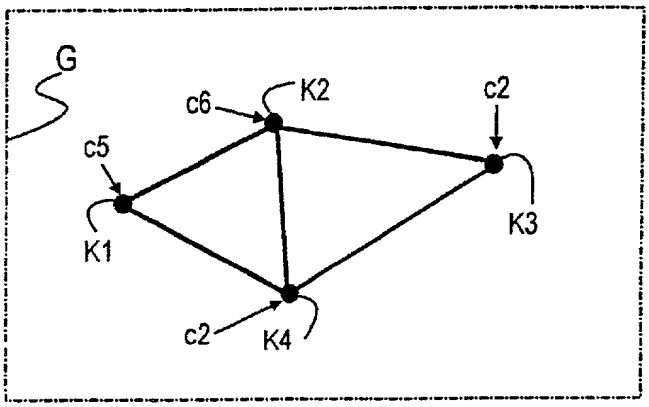

FIG 3C

E = 1000 * 3 (3 CDMA codes used: c2, c5, c6)
+ 2000 * 1 (1 CDMA code in adjacent cells)
+ 1000 * 1.26 (1.0 + 2 x 0.1 + 0.05 + 0.01)

where: c2↔c2 ⇒ kc2_2: 1.0
c6↔c2 ⇒ kc6_2: 0.1
c5↔c2 ⇒ kc5_2: 0.05
c5↔c6 ⇒ kc5_6: 0.01

= 6260

FIG 4

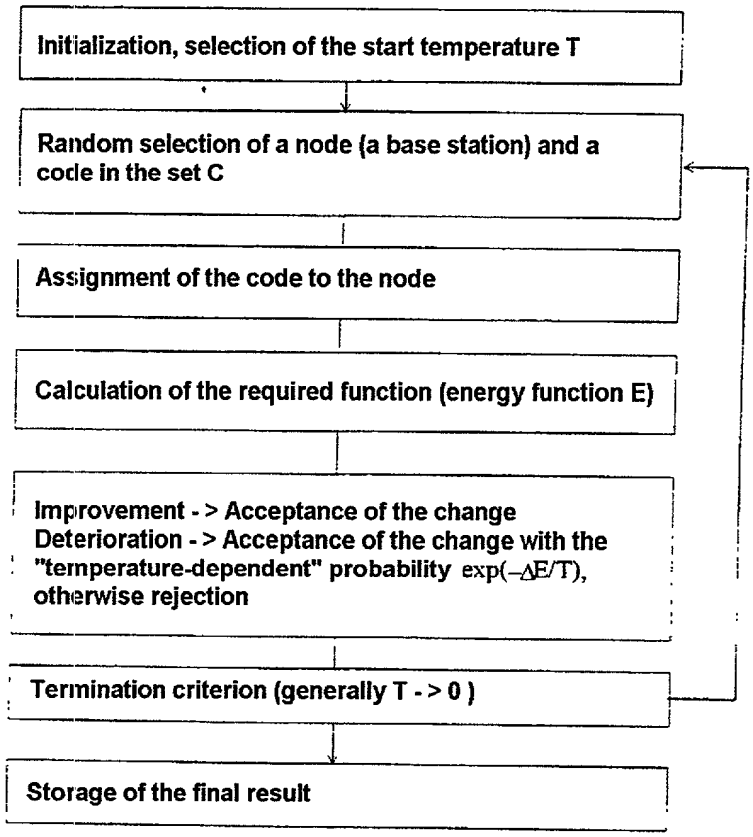
Initialization, selection of the start temperature T
Random selection of a node (a base station) and a code in the set C
Assignment of the code to the node
Calculation of the required function (energy function E)
Improvement - > Acceptance of the change
Deterioration - > Acceptance of the change with the "temperature-dependent" probability exp(-ΔE/T), otherwise rejection
Termination criterion (generally T - > 0)
Storage of the final result

FIG 5A

Base station	CDMA code
BS1	c5
BS2	c1
BS3	c5
BS4	c6

FIG 5B

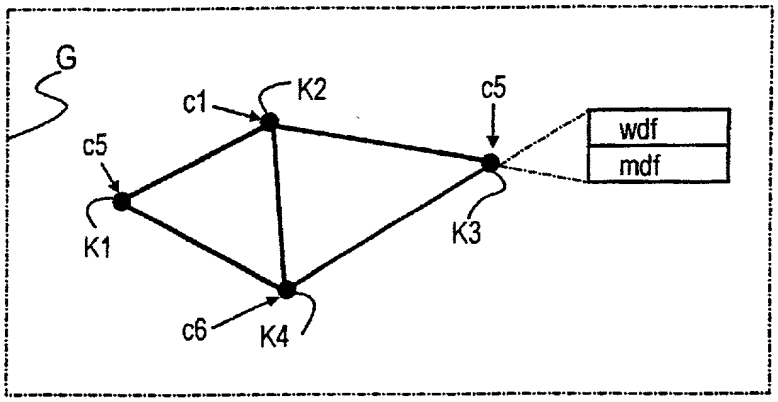

FIG 5C

E = 1000 * 3 (3 CDMA codes used: c2, c5, c6)
+ 2000 * 0 (no CDMA code in adjacent cells)
+ 1000 * 0.04 (2 x 0.0 + 2 x 0.01 + 0.02)

where: c2↔c5 ⇒ kc2_5: 0.0
c5↔c6 ⇒ kc5_6: 0.01
c1↔c6 ⇒ kc1_6: 0.02

= 3040

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER
112740-137

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
METHOD FOR ALLOCATING AT LEAST ONE VALUE OF AT LEAST ONE TRANSMISSION PARAMETER TO CELLS IN A COMMUNICATIONS SYSTEM HAVING m CELLS

the specification of which (check only one item below):

☐ is attached hereto.

☒ was filed as United States application
Serial No. 09/701,590

on November 29, 2000,

and was amended

on _____(if applicable).

☐ was filed as PCT international application

Number _____

on _____,

and was amended under PCT Article 19

on _____(if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
Germany	19824140.2	29 May 1998	☒ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO

Combined Declaration For Patent Application and Power of Attorney (Continued) (Includes Reference to PCT International Applications) PCT/DE99/01491

ATTORNEY'S DOCKET NO. 112740-137

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject mater of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, Untied States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) Robert M. Barrett (Registration No. ~~30,142~~), Timothy L. Harney ~~(38,174)~~, Renato L. Smith (~~45,117~~), Alan J. Barry ~~(30,819)~~, Patricia A. Kane ~~(46,446)~~, Thomas C. Basso ~~(46,541)~~, Adam H. Masia (35,602), Dante J. Picciano (33,543), Amy J. Gast (41,773), Michael S. Leonard (37,557), William E. Vaughan ~~(39,056)~~ and Robert W. Connors (46,639) all members of the firm of Bell, Boyd & Lloyd

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203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
Carsten Ball		
DATE 04/02/2001	DATE 04/02/2001	DATE